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ART. XIII.—*Two Species of Ophiocytium Nägeli in Victoria; O. terrestre, n. sp., and O. arbuscula Rabenhorst.*

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Two species of *Ophiocytium Nägeli* have previously been recorded for Victoria. In 1906, Hardy(3) recorded the finding of *O. parvulum* A. Braun, at Heidelberg, Melbourne, and of *O. bicuspidatum* Lemmerman, in a swamp at Cheltenham, near Melbourne. Additional species have been found in other Australian States, and include *O. cochleare* A. Braun. from the Blue Mountains, New South Wales(2), *O. bicuspidatum* Lemmerman from Mount Dromedary, New South Wales(1, 2), *O. minus* Nägeli from the Johnstone River, North Queensland(1, 2), and *O. arbuscula* Rabenhorst (*Sciadium arbuscula* A. Braun) at Burpengary, Queensland(1). In this paper two further species are recorded for Victoria, one of which, *O. terrestre*, n. sp., is from the soil, and the other, *O. arbuscula* Rabenhorst, is from a pond at Royal Park, Melbourne.

Soil Form.

During an examination of the algal flora of virgin bush soil from Heathmont, an outer suburb of Melbourne in the Silurian belt, a species of *Ophiocytium Nägeli* was observed. This appears to be the first record of the genus from the soil. The organism was found in one of a series of culture flasks which had been inoculated with a dilute soil suspension and allowed to incubate at room temperature. The soil sample was collected in May and included soil from the surface to a depth of 3 inches. The sample was thoroughly mixed and sieved, then 10 grams of it were taken at random, and shaken in 50 cc. of mineral salts solution. This soil suspension was progressively diluted by halves, a sample at each dilution being incubated. An *Ophiocytium* appeared in one flask only, the seventh of the series with a dilution of one in 1280; this on investigation has proved to be a distinct species.

The organism belongs to the section of *Ophiocytium* including forms which are not firmly attached to some substratum, and is a non-colonial form. The cell varies in size, adult forms measuring up to 135 μ in length and from 9 to 12 μ in breadth, younger ones being, on an average, 26 μ long and 9 μ broad. These younger cells are more or less straight, while the adult ones are slightly curved. The cell wall appears to be quite characteristic of the genus, having a fairly apparent apical cap which, in the younger cells especially, is narrower in diameter

than the rest of the cell, giving a characteristic shape to the organism. There are several parietal chloroplasts, slightly yellowish green in colour, the whole of the cell contents having a very granulated appearance. At the basal end is a slender stalk or appendage which varies in length from 6 to 16μ , the variation bearing no relation to the size of the cell to which it is attached. The stalk is curved, often very much twisted, and, unlike *O. maius*, has no swelling at the end (Fig. 1, A, B, and C.)

Reproduction by both aplanospores and zoospores has been observed (Fig. 1D, 1E). Several cells containing aplanospores were noted but, with one exception, the cap of the mother cell had become detached and some of the aplanospores had been freed, leaving for the most part one but occasionally two aplanospores within the parent wall. In the one exception (Fig. 1D) four spores were found in the mother cell, each having the narrow apical cap typical of the species. The length of these spores ranged from 20 to 25μ while the breadth was fairly constant, being about 7.5μ .

In one instance only were zoospores seen inside the mother cell (Fig. 1E), and there, unfortunately, the apical cap had been shed so that it is quite probable some of the zoospores had escaped already, four however remaining. These four were ovoid in shape, contained two parietal chloroplasts, and measured, on an average, 11μ in length and 2.5μ in breadth. In only one zoospore could the cilia be distinguished, and here two cilia were distinctly seen, one being longer than the other. The longer one measured 5μ , the shorter one approximately 1μ , this latter being more difficult to measure since it was obscured to some extent by another zoospore. The development of the zoospore into the adult condition was not followed, as this was too difficult and too uncertain in a mixed culture.

There are six species of *Ophiocytium* already described which are free living, i.e., not attached to any substratum, and non-colonial, and of these only three have an appendage at one end—*O. maius* Nägeli, *O. cochleare* A. Braun, and *O. Lagerheimii* Lemmerman. Of these three, the species described above approaches nearest to *O. maius* in general appearance; the cells of *O. maius*, however, are much longer, measuring from 500 – 3000μ , while in the former no cells over 135μ have been observed. Also at the terminal end of the stalk of *O. maius* there is a distinct swelling or knob which is not developed in my species. Then, too, the shape of the latter is different, having a narrow apical cap which is apparently quite characteristic of the species. Both *O. cochleare* and *O. Lagerheimii* are narrower forms, the diameter of the former measuring 6 – 7μ and of the latter 3 – 5μ , as compared with 9 – 12μ in the species from the soil. Also in both *O. cochleare* and *O. Lagerheimii* the appendage at the basal end of the cell is straight and needlelike, while in my

species it is curved, often very much bent, and not in the least needlelike. The species from the soil was therefore concluded to be new, and to it the name of *Ophiocytium terrestre* is given.

The organism grew very well in the mineral salts solution in which it was isolated from the soil among other algae which belonged mainly to the Chlorophyceae, but up to the present it has not been obtained in pure culture.

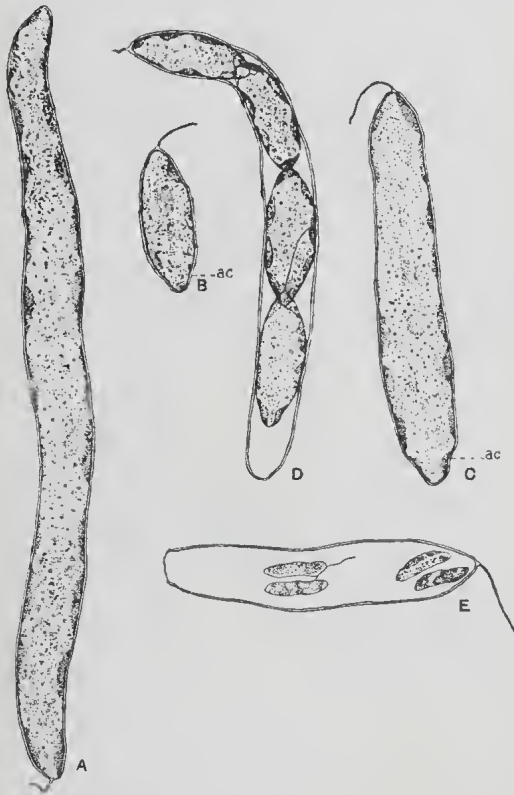


FIG. 1.—*Ophiocytium terrestre*, n. sp.:—
 A. Adult cell. B. Very young cell with characteristic apical cap (ac). C. Older cell with characteristic apical cap (ac). D. Mother cell containing 4 aplanospores. E. Mother cell from which apical cap has been shed, containing 4 zoospores.

OPHIOCYTIUM TERRESTRE, n. sp.

(Fig. 1.)

The cells are always solitary, never forming colonies and never attached to the substratum. Adult cells are slightly curved, having at the basal end a slender stalk curved or very

much bent and without a terminal swelling. The cells measure up to 135μ in length and from $9-12\mu$ in breadth. Reproduction by both aplanospores and zoospores has been observed.

Cellulis solitariis semper, nunquam colonicis, numquam ad fundamentum affixis. Cellula adulta leviter curvata, stipite gracile curvato sine nodo ad extremum. Cellulis maximis 135μ longis et $9-12\mu$ latis. Propagatio et aplanosporis et zoosporis.



FIG. 2.—*Ophiocytium arbuscula* Rabenhorst:—

- A. More mature colony. B. Very young colony.
C. Detached daughter cell. D. Single cell.

Pond Form.

The second species of *Ophiocytium* recorded in this paper was found attached to filaments of *Oedogonium* sp., growing in a pond at Royal Park. Upon examination it proved to be

Ophiocytium arbuscula Rabenhorst (*Sciadium arbuscula* A. Braun), which has been recorded for Queensland as *Sciadium arbuscula* A. Braun. This, however, is the first record of this species for Victoria.

OPIHOCYTIUM ARBUSCULA Rabenhorst.

(Fig. 2.)

As the material examined was in every way typical of the species a brief description will suffice. Both single cells and colonies were abundant in the sample. The single cells were straight or very slightly curved, and measured up to 70μ in length, and from 4.5 – 5.5μ in breadth. Each cell contained several yellowish green parietal chloroplasts. At the base there was a short straight stalk about as long as the cell is wide, by which the organism was attached to the substratum—in this case mainly filaments of *Oedogonium* sp. The end of the stalk, the actual attaching disc, was in every case obscured by brown debris. At the apex of the cell the cell wall was thickened to form the apical cap characteristic of the genus. (Fig. 2b.)

Although some of the colonies examined were more mature than others none showed secondary branching. In the younger colonies the empty mother cells were, on an average, 70μ long and 4.5μ in diameter, while the daughter cells which were attached to the rim of the empty mother cell measured up to 11μ in length and 4.5μ in breadth. In one colony one of these daughter cells had become detached from the rim of its parent, and on the attaching end of the stalk a distinct swelling could be seen (Fig. 2C). In the larger colonies the empty mother cells measured up to 120μ in length, while the daughter cells which were more or less curved measured from 47μ to 67μ in length, the diameter in all cases ranging between 4.5 and 5.5μ . (Fig. 2A.)

In the following paragraph a key* has been given by which the various species of *Ophiocytium* can be readily separated.

I. Cells free, not attached.

(SECTION BROCHIDIUM).

i. Living as single cells.

A. Cells with an appendage at one end only.

(a) Appendage ending with a swelling. *O. maius.*

* The key is, in the main, a translation of the *Ophiocytium* key given by Pascher(4), in Die Süßwasserflora Deutschlands, Osterreichs, und der Schweiz. Heft II.

- (b) Appendage without a swelling.
- i. Appendage straight and needlelike.
 - (1) Appendage short. *O. cochleare*.
 - (2) Appendage very long. *O. Lagerheimii*.
 - ii. Appendage bent, not needlelike. *O. terrestre*.
- B. Cells with appendage at both ends, the anterior shorter one often developing as a spine.
- (a) Cell thin, 2.7–10 μ broad. *O. capitatum*.
 - (b) Cell over 10 μ thick. *O. bicuspidatum*.
- C. Cells without any appendage. *O. parvulum*.
- ii. Cells forming colonies.
- A. Daughter cells sitting on the mouth of the mother cell.
- (a) Appendage at one end of the cell. *O. cochleare*.
 - (b) Appendage at both ends of the cell. *O. capitatum*.
- B. Cells joined by stalks. *O. Lagerheimii*.
- II. Cells with shorter or longer stalks, firmly attached, often colony forming.
- i. No colony formation, with relatively long stalk and large attaching disc. *O. desertum*.
 - ii. Colony formation (in the adult condition).

(SECTION SCIADIUM).

- A. Cells without a spine at the free end.
- (a) Stalk approximately as long as the cell is wide. *O. arbuscula*.
 - (b) Stalk 2–3 times as long as the cell is wide. *O. gracilipes*.
- B. Cells with a distinct spine. *O. mucronatum*.

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